

Ethanol In California Reformulated Gasoline Subgroup Presentation

Report of the Ethanol Working Group

Non-Petroleum Fuel Working Groups Conference

California Energy Commission

Sacramento, California

October 12, 2004

Ethanol In California Reformulated Gasoline

Discussion Topics

- **Characteristics of Ethanol in CaRFG3**
- **Transition from CaRFG2 to CaRFG3**
- **Barriers and Uncertainties**
- **Market Potential Projections**
- **Business-as-Usual Scenario Approach and Assumptions**
- **Aggressive Scenario Approach and Assumptions**
- **Conclusions and Next Steps [Actions]**
- *Prepared by Mike McCormack with input from Dean Simeroth, Al Jessel, Tom Koehler, Loren Beard, Peg Gutmann, Will Coleman and Bob Reynolds*

Ethanol In California Reformulated Gasoline

Defining Characteristics

- Ethanol is California's incumbent oxygenate (only approved substitute for MTBE under the state's multi-media environmental review process)
- California refineries rely on ethanol to help replace gasoline volume lost with MTBE phaseout and help meet CaRFG3 and other gasoline specifications
- Most California gasoline must satisfy federal minimum oxygen content requirements but refiners would prefer the flexibility of blending oxygenate on a voluntary basis
- CaRFG is produced with 5.7 volume percent ethanol
- ARB is obligated under statute to preserve air quality benefits obtained under CaRFG2 fuel specifications
- ARB's Predictive Model is one important regulatory tool needed to preserve AQ benefits and a process exists for updating this model (currently scheduled in 2005)

Ethanol In California Reformulated Gasoline

Defining Characteristics (continued)

- The existing petroleum infrastructure allows for some growth in ethanol volume throughput with little additional capital expense
- California's common carrier pipeline and storage facilities have limited flexibility and can not currently transport CaRFG containing ethanol (water contamination and pipeline safety considerations)
- California's petroleum infrastructure development is constrained, and refineries are producing at maximum levels
- CaRFG demand is growing between 1.5 and 2.3 percent a year, and imports of gasoline and blending components (through constrained import facilities) have been increasing to meet that new demand.
- Ethanol for blending in CaRFG arrives predominantly by rail from Midwest locations while roughly 10% is supplied by ship or barge.

Ethanol In California Reformulated Gasoline

Transition to CaRFG3

- MTBE phase-out completed and the use of CaRFG2 discontinued on Dec 31, 2003
- Ethanol is now blended with CARBOB at more than 60 petroleum products terminals to make CaRFG3
- New production capacity in the Midwest combined with some non-domestic imports allowed for an orderly transition to ethanol use on the East and West coast simultaneously
- CaRFG3 (containing about 5.7 volume percent ethanol) is projected to be about 95% of all California gasoline sold in 2004
- Ethanol use for gasoline blending is projected to be between 900 and 950 million gallons in 2004

Ethanol In California Reformulated Gasoline

Barriers and Uncertainties

■ **Regulatory Considerations**

- ARB's predictive model to be updated in 2005 (may or may not yield ability to blend higher volumes of ethanol)
- Lack of a federal decision on California's oxygen waiver request impedes investments in ethanol production and petroleum infrastructure
- CaRFG specifications are under review by ARB and CEC for possible changes that could generate additional AQ benefits while preserving CaRFG production levels
- A recent study by CRC confirms permeation emissions from the use of CaRFG3 (relative to CaRFG2) that must be mitigated

Ethanol In California Reformulated Gasoline

Barriers and Uncertainties

■ **State Policy Considerations**

- Air Quality and Energy Policy as they relate to transportation fuels are not integrated (all fuels)
- The renewable fuel aspect of ethanol as both carbon reducing (climate change) strategy and petroleum reduction strategy has not been fully evaluated

Ethanol In California Reformulated Gasoline

Barriers and Uncertainties

Economics

- Federal incentive structure not guaranteed in the future (though 2010 extension probable)
- Ethanol can be more expensive than gasoline or gasoline blending components even with the federal incentive, however, this is not a frequent event
- Investment in California ethanol production is hampered by a lengthy permitting process and costs, uncertainty created by federal inaction on California's oxygen waiver request and the Renewable Fuel Standard (RFS), and competition from new would-be producers in Midwest and other states.

Ethanol In California Reformulated Gasoline

Barriers and Uncertainties

■ **Technology/Data**

- Lack of data limits the ability of ARB staff to quickly update the Predictive Model
- Mitigation of evaporative and permeation emissions in California motor vehicles resulting from the use of CaRFG3 is needed.

Ethanol In California Reformulated Gasoline

Barriers and Uncertainties

Infrastructure

- Pipeline and storage limitations discourage multiple CARBOBs or CARBOB and CaRFG in the distribution system without further investments
- Growth in the distribution of ethanol to terminals could create new environmental impacts and risks needing mitigation

Ethanol In California Reformulated Gasoline

Market Projection Scenario Results

	Gasoline Demand (Million gal/yr)	BAU (5.7% blending)	AG (10% blending)
2010	17,139	879	1543
2015	18,208	830	1639
2020	19,519	890	1757

BAU- Business As Usual (Mgal/yr)

AG- Aggressive (Mgal/yr)

Ethanol In California Reformulated Gasoline Business-as-Usual Assumptions (5.7% blending)

- Ethanol is blended at 5.7 percent by volume through 2020
- Ethanol supply and demand imbalances are averted through domestic industry growth combined with imports that cap U.S. domestic price (i.e. mirrors recent history)
- Ethanol price differential relative to gasoline and gasoline blending components mirrors recent history (i.e. refinery blending economics, on average, mirror today's situation)
- Outcome of California's oxygenate waiver request plays no role in California's ethanol use on average; rather, octane needs, favorable economics and CaRFG demand supports current blending practices.
- Predictive Model update retains the 2.0 weight percent oxygen limit (i.e. 5.7 volume % ethanol) to control NOx
- Federal Fuel excise tax is extended to 2020

Ethanol In California Reformulated Gasoline

Aggressive Case Assumptions (10.0% blending)

Predictive Model update combined with other ARB regulatory actions permits 10% ethanol blending while retaining air quality benefits of CaRFG2.

- Ethanol supply and demand imbalances are averted through domestic industry growth combined with imports that cap U.S. domestic price (i.e. mirrors recent history)
- Infrastructure expands more than BAU to accommodate 10% blending at some additional cost
- Ethanol price differential relative to gasoline and gasoline blending components mirrors recent history (i.e. refinery blending economics, on average mirror or are better than today's economics)
- Outcome of California's oxygenate waiver request does not impact ethanol use: rather octane needs, favorable economics and CaRFG demand support 10 volume % ethanol blending
- Federal Fuel excise tax is extended to 2020

Ethanol In California Reformulated Gasoline

Conclusions and Next Steps

Conclusions

- 1) Ethanol in CaRFG leads other non-petroleum fuel use options in terms of non-petroleum fuel use
- 2) Ethanol in CaRFG can likely maintain a stable non-petroleum fuel use floor close to the 5% through 2020.
- 3) Under an aggressive scenario that requires retention of the air quality benefits attained with CaRFG2, ethanol may achieve close to 10% non-petroleum fuel use before 2010 and holding steady at that level to 2020
- 4) Given BAU and AG scenario assumptions contained in this analysis, ethanol use is around 900 million gal/year and 1.8 billion gal/yr, respectively in 2020 at current gasoline demand growth rates.
- 5)

Ethanol In California Reformulated Gasoline

Next Steps (Actions)

Actions steps are under discussion within the Ethanol in CaRFG Subgroup of the Ethanol Working group